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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,596	11/24/2003	Jingxian Wu	MERL-1516	5013

7590 07/28/2006

Patent Department
Mitsubishi Electric Research Laboratories, Inc.
201 Broadway
Cambridge, MA 02139

EXAMINER	
HAROON, ADEEL	

ART UNIT	PAPER NUMBER
2618	

DATE MAILED: 07/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/720,596	WU ET AL.	
	Examiner	Art Unit	
	Adeel Haroon	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 24 May 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-7 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office Action is in response to Amendment filed on date: 5/24/06.

Claims 1-7 are still pending.

Response to Arguments

2. Applicant's arguments filed 5/24/06 have been fully considered but they are not persuasive.

The applicant argues that Hottinen et al. do not disclose the added limitation of "so that the phases for all received signals at the receiver are within ninety degrees of each other", but instead discloses where phase differences are diametrically opposed to each other. The examiner respectfully disagrees. Hottinen et al. disclose that the feedback information "determined by the phase difference, are transmited in successive slots, e.g. the real part bit in the odd slots used as a first feedback subchannel and the imaginary part bit in the even slots used as a second subchannel" (Column 11, lines 29-34). Hottinen et al. also disclose that these "odd slots S_{odd} indicates a phase difference of 0 or 180, and the feedback information provided in the even slots S_{even} indicates a phase difference of –90 or +90" (Column 11, lines 51-55). As can be seen by these

cited passages, Hottinen's "four state resolution" (Column 11, line 46) sends a feedback bit indicating a phase difference of 0, -90, +90, or 180 by using either the odd or even slot thus resulting in that phases for all received signals are within ninety degrees of each other.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanaka (U.S. 2003/0124995) in view of Hottinen et al. (U.S. 6,754,286).

With respect to claim 1, Tanaka discloses a method for improving transmit diversity gain in a wireless communication system including a transmitter with a plurality of transmit antennas and a receiver with one receive antenna in figure 3 and 4. Tanaka discloses partitioning the plurality of transmit antennas into a plurality of groups of transmit antennas (Paragraph 49). Tanaka also discloses measuring, in the receiver, a phase of a channel impulse response for each transmit antenna; determining, independently, feedback information for each group of transmit antennas from the

channel impulse responses; and sending the feedback information for each group of transmit antennas to the transmitter (Paragraph 41). Tanaka teaches orthogonal space-time block encode input symbols in the transmitter to produce a data stream for each group of transmit antennas (Paragraph 52). Tanaka further teaches adaptive linear space encoding each data stream according to the feedback information for the group to produce an encoded signal for each transmit antenna of each group (Paragraph 45). Tanaka does not expressly disclose that the method will result in the phases for all received signals at the receiver are within ninety degrees of each other. However, Hottinen et al. discloses a method for improving transmit diversity gain in a wireless communication system including a transmitter with a plurality of transmit antennas and a receiver with one receive antenna (Column 9, line 45 – Column 10, line 2) thus making it analogous art since it is in the same field of endeavor. Hottinen et al. teach determining feedback information indicating a required rotation of each other signal so that a phase of a signal is within is in a quadrant phase sector, within ninety degrees, of the reference phase (Column 11, lines 51-55). Therefore, it would be obvious to one of ordinary skill in the art at the time of the applicant's invention to apply Hottinen et al.'s quadrant phase sectoring technique to the method of Tanaka in order to better synchronize all channel impulse responses.

With respect to claim 2, Tanaka further discloses selecting one of the channel impulse responses as a reference channel impulse response and normalizing the measured phase according to a phase of the reference channel impulse (Paragraph 50). Tanaka does not expressly disclose that a normalized phase is in a quadrant

phase sector of the reference phase. However, Hottinen et al. discloses a method for improving transmit diversity gain in a wireless communication system including a transmitter with a plurality of transmit antennas and a receiver with one receive antenna (Column 9, line 45 – Column 10, line 2) thus making it analogous art since it is in the same field of endeavor. Hottinen et al. teach determining feedback information indicating a required rotation of each other signal so that a phase of a signal is within is in a quadrant phase sector, within ninety degrees, of the reference phase (Column 11, lines 51-55). Therefore, it would be obvious to one of ordinary skill in the art at the time of the applicant's invention to apply Hottinen et al.'s quadrant phase sectoring technique to the method of Tanaka in order to better synchronize all channel impulse responses.

With respect to claim 3, Tanaka discloses that the reference channel impulse response has the highest power (Page 8, Column 1, lines 54-60).

With respect to claim 4, Hottinen et al. teach that the quadrant phase sector spans ninety degrees (Column 11, lines 51-55).

With respect to claim 5, Tanaka discloses that the normalization rotates the phase and the feedback information encodes an amount of rotation (Paragraph 50).

With respect to claim 6, Tanaka discloses four transmit antennas and each group has two transmit antennas in figure 4 (Paragraph 63). Tanaka also discloses that the feedback information is one bit for each group (Paragraph 14).

With respect to claim 7, Tanaka discloses a wireless communication system in figures 3 and 4 with a transmitter, base station, comprising a plurality of groups of

transmit antennas (Paragraph 49). Tanaka discloses a means for generating input symbols and an orthogonal space-time block encoder configured to produce a data stream for each group of transmit antennas (Paragraph 52). Tanaka also discloses an adaptive linear space encoder, element number 38, configured to produce an encoded signal for each transmit antenna of each group from the data stream for the group according to feedback information for the group (Paragraph 45). Tanaka further discloses a receiver with a single receive antenna, element number 32, and a means, element number 33, for measuring a phase of a channel impulse response for each transmit antenna and determining independently the feedback information for each group of transmit antennas from the channel impulse responses (Paragraph 41). Tanaka's receiver also has a means, element number 35, for sending the feedback information for each group of transmit antennas to the transmitter (Paragraph 41). Tanaka does not expressly disclose that encoding the signals will result in the phases for all received signals at the receiver are within ninety degrees of each other. However, Hottinen et al. discloses a wireless communication system including a transmitter with a plurality of transmit antennas and a receiver with one receive antenna (Column 9, line 45 – Column 10, line 2) thus making it analogous art since it is in the same field of endeavor. Hottinen et al. teach determining feedback information indicating a required rotation of each other signal so that a phase of a signal is within is in a quadrant phase sector, within ninety degrees, of the reference phase (Column 11, lines 51-55). Therefore, it would be obvious to one of ordinary skill in the art at the time of the

applicant's invention to apply Hottinen et al.'s quadrant phase sectoring technique to the system of Tanaka in order to better synchronize all channel impulse responses.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adeel Haroon whose telephone number is (571) 272-7405. The examiner can normally be reached on Monday thru Friday, 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nay Maung can be reached on (571) 272-7882. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AH
7/17/06

NguyenVo
7-19-2006

NGUYEN T. VO
PRIMARY EXAMINER